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THE TECHNOLOGICAL FEATURES, QUALITY AND SHELF LIFE OF BROCCOLI VARIETIES AND HYBRIDS

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ANNOTATION

This article presents the results of research on the cultivation of broccoli seedlings in the climatic conditions of Uzbekistan, planting at different periods and its growth, development, yield, storage and, selection of varieties and hybrids, as well as the impact of weather conditions. According to the results of the study, high productivity and longer storage were achieved in the cultivation of hybrids Naxos F_1 and Agassi F_1 hybrids. It is reported that the best result in the storage of raw materials in various methods and containers is achieved in the use of polyethene films.

Keywords: Broccoli cabbage,hybrid,growing technology; efficiency, storage.

INTRODUCTION

One of the strategic objectives of the agrarian policy of the Republic is to form an effective competitive agro-industrial production that will ensure food security and its integration into the country. If such competition is formed, local products will be able to compete worthily. The market should definitely have different quality and prices. To do this, one of the main tasks today should be not only to provide the domestic market with the required amount of high-quality products, but also the cultivation of agricultural products for export. To solve this problem, of course, it is necessary to increase the range of agricultural products grown in our country, including vegetable varieties.

The whole world knows vegetable crops as plants that are powerful regulators in health. The total production of vegetables in the world's agricultural crops reaches a billion tons per year. The growth of vegetable production is 70-80 million tons. It is safe to say that today no other sector of agriculture in the world is developing at such a pace [4,6].

In terms of consumption, vegetables, potatoes, bread and dairy products are in fourth place in the daily diet. However, vegetables are an important source of vitamins and a biologically beneficial product. Based on the accumulated experience, the natural and climatic conditions of our country allow growing a wide variety of these crops. In order to increase the range of vegetables in the temperate natural and climatic conditions of the country, the effective use of irrigated lands, the use of effective agro-technologies in the cultivation of broccoli cabbage at different times, increasing productivity, storage and processing, as well as increasing gross output.

In recent years, large-scale measures have been taken in this direction in our country. The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 identifies one of the important strategic tasks as "... optimization of arable land and crop composition, the introduction of advanced

agricultural technologies and increasing productivity, increasing the production of fruits, vegetables and grapes."

Therefore, it is necessary to widely introduce innovative agro-technologies in agriculture, aimed at radically improving the quality and productivity of vegetable crops [1, 2].

The main task of vegetable development in Uzbekistan is to produce ecologically clean, high-quality and export-oriented products in fresh and processed form and to fully meet the needs of the population throughout the year

An important condition for increasing the yield of vegetable crops is to improve product quality by improving varietal resources, increasing valuable nutrients and increasing the minimum accumulation of toxins. Climate-adapted, disease-resistant varieties and hybrids form the basis of a high, environmentally friendly yield. That is why there is a growing need for varieties of vegetable crops with high taste and technological qualities, designed for processing and fresh consumption.

Broccoli cabbage belongs to the family of cauliflower because it is considered a biological generation. In Uzbekistan, broccoli is still an uncommon and unconventional crop. It is very popular in the world and occupies about 250 thousand hectares of land.

It is world gross domestic product is about 3 million tons, of which 75 thousand tons to Europe. e, its production is 900 thousand. t .; including Spain - 35 thousand. and 450 thousand tons, Italy - 12 thousand and 150 thousand tons, Great Britain - 8 thousand and 100 thousand tons, Poland - 7.5 thousand and 100 thousand tons. Large areas of broccoli cover China, India, and Japan [6,14].

The average per capita consumption per year in the UK is 5 kg, in the US - up to 3-4 kg, in Japan, Germany and the Scandinavian countries - 2 kg.

Like cauliflower, the nutritious organ of broccoli is its head. They are similar in appearance but differ in colour and degree of deformation of flower buds. If the cauliflower has these strongly branched, thick inflorescences, they are buds formed in broccoli or not developed strong enough.

Unlike cauliflower, broccoli forms small heads that are fit for consumption in the leaf axils, especially after the top head is removed.

Ahead of broccoli is considered caloric compared to ahead of cauliflower (raw mass 150 to 121 kJ). It is valued more for its chemical composition. The dry matter content of broccoli is 12.3%, which is 11.7% in cauliflower, proteins - 2.5% in 3.5 cauliflower, carbohydrates - 5.5% in cauliflower, 2.9%, cellulose - 1% in cauliflower, 0.9%. , vitamins mg / 100 g: S - 114 in cauliflower 105, provitamin A - 1.9 in cauliflower 0.02, V2 - 0.21 in cauliflower 0.10, RR - 1.0 in cauliflower 0.6. It contains a large number of V1, E, K, U and others. Broccoli head is, in essence, a ready-made multivitamin.

Table 1.

Table 1. Comparison of the chemical composition of broccoli with other cabbages (data A.E. Tokar 2014)

№	Name	Cauliflower	Broccoli	White cabbage	Beijing cabbage
1	Dry substances	11.7	12.3	11.2	6.7
2	Proteins	2.5	3.5	1.8	1.5
3	Carbohydrates	2.9	5.5	4.7	1.4
4	Cellulose	0.9	1	2	2

5	**Vitaminsmg / 100 g:**				
	Vitamin C	105	114	67	30
	Provitamin A	0.02	1.9	0.3	1.8
	VitaminB_2	0.10	0.21	3.9	2.8
	PP	0.6	1.0	4.5	2

Broccoli is rich in fast-digesting protein (3.2 -4.5%), which is higher than potatoes and other vegetables. These proteins contain substances that prevent the accumulation of cholesterol in the body. According to the constant amino acid content in the protein, broccoli does not lag behind beef and chicken eggs.

Cauliflower has 2 times more protein, vitamin C, 3 times more vitamin U, 5 times more vitamin E, 4 times more flavonoids and 50 times more carotene. Broccoli contains large amounts of methionine, folic acid, riboflavin, thiamine. Compared to other cabbages, vegetables and fruits, broccoli contains several times more carotene, only in this respect it lags behind carrots [6, 14].

Broccoli is rich in potassium salt, phosphorus, calcium, magnesium and other trace elements, 1.5-2 times more than cauliflower in terms of mineral salts. Mg / 100 g contains potassium 370-490, phosphorus 82-87, calcium - 105 -556, sodium - 16, magnesium 22-31, iodine - 1.2-2, iron 1.3-1.7, manganese. - 0.2. Broccoli is a good source of calcium, potassium, phosphorus, iron and manganese for the human body.

The fact that the economic, nutritional, therapeutic and prophylactic properties of broccoli are much higher than other vegetables indicates the need to increase the area under crops.

Increasing the planting of broccoli certainly poses a problem for its storage, and the selection of storage varieties and hybrids is required.

In this regard, we conducted experiments on 7 varieties and hybrids of broccoli cabbage to select the most productive and suitable for storage in early spring and summer. In the experiment, the Fiesta F1 hybrid was taken as standard.

The purpose of the study:

It is important to select different storage varieties and hybrids of broccoli and to organize the quality of storage in different ways, as well as to identify substances in the stored product with high nutritional and pharmacological properties.

The objectives of the study are:

- Selection of preservative varieties of broccoli and hybrids;
- Calibration of storage broccoli varieties and hybrids, as well as the determination of optimal temperature and relative humidity for long-term storage;
- To determine the degree of ripeness, chemical composition, the hardness of broccoli cabbage and the relationship of the amount of dryness to the environmental conditions in which it is grown;
- Study of the technological, organoleptic and biochemical composition of broccoli varieties and hybrids;
- Development of scientifically based recommendations for the cultivation and storage of broccoli:

The object of research:

Ensuring the separation of varieties with high natural preservation of broccoli cabbage during storage and high content of vitamins in it, as well as its calibration and determination of the optimal temperature and relative humidity for long-term storage.

The subject of research:

Chemical composition, quality indicators and equipment for determining the moisture content of broccoli cabbage, standard requirements for their determination. Raw material storage warehouses and refrigeration equipment, pre-storage processes of raw materials in various ways, long-term stored products are equipment for determining the quality indicators.

Research methods:

In scientific research, the agro-technological properties of broccoli cabbage are evaluated and the methods of its storage and the existing physical and chemical processes in them, as well as environmental factors and dependencies of the region where the product is grown, are studied using various research methods.

Research options:

Fiesta F_1 broccoli (control), Stromboli F_1, Parthenon F_1, Agassi F_1, Naxos F_1, Quinta F_1 and Belstar F_1 hybrids were selected. The experiment was performed in four iterations, with the options placed in a random block method. Seedlings were planted in the first ten days of June according to the scheme 70x30 cm (47.6 thousand ha/ha).

Agassi hybrid seedlings were planted at different times from early June. Broccoli cabbage harvest was maintained at 0±3°C in air conditioners and refrigerators. Broccoli cabbage was stored in boxes with a capacity of 2 kg, wrapped in foil with a thickness of 50 μm and packed (the mass of products in one package is 2.5 kg).

Field, laboratory, and statistical data were used during the experimental work. Phenological observations, biometric measurements, calculations and analyzes were performed. Harvesting was performed separately in each experiment. The products were divided into commodities and non-commodities, and only commodities were separated for storage.

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Research results:

Seven broccoli hybrid seeds selected during the study years were sown in cassettes measuring 4x4 cm in cell size in the last decade of January each year. When planting seedlings, first of all, was prepared and placed in all cassettes. In the next stage, 300 varieties of each variety and specimen were selected and planted in one cell. (Figure 1)

Fig 1.

Field germination of broccoli seeds A 2018 study showed that Fiesta F1 and Belstar F1 germinated slightly earlier among planted varieties and hybrids. Among the hybrids, later germination was observed in the Parthenon F1 Quinta F1.

Observations show that the full germination rate of broccoli hybrids was observed in Fiesta F1 Naxos F1 and Belstar F1 in 18 days in our 2018 study. In our next research, that is, in 2019, the earlier germination of seeds was observed in Fiesta F1 Agassi F1 and Naxos F1. Full germination of seeds was observed again this year in Fiesta F1 Stromboli F1 Agassi F1 and Naxos F1.

In our 2019 observations, Parthenon F1 and Quinta F1 had a slightly lower rate of non-germinated seeds of broccoli varieties and hybrids (24.34).

In the third year of our experiments, in 2020, the field fertility of broccoli varieties and hybrids did not differ much from previous years, but this year the yield of hybrids Quinta F1 and Parthenon F1 was much lower than other hybrids (79. 80%) (Table 2).

Table 2.

Table 2. Seed germination dynamics (2018-2020, units /%)

№	The name of the hybrids	Fiesta$F_{1.control}$	Strombili F_1	Parthenon F_1	Agassi F_1	Naxos F_1	Quinta F_1	Belstar F_1
The day the seeds are sown 28.01.2018								
Date of follow-up	**01.02.2018y**	42	21	16	37	37	16	38
	05.02.2018y	173	146	142	157	158	149	164
	10.02.2018y	276	263	243	283	273	239	276
	15.02.2018y	291	274	264	287	289	258	286
	Once	**9**	**26**	**36**	**13**	**11**	**42**	**14**
	They did not sprout,%	**3.0**	**8.6**	**10.8**	**4.3**	**3.3**	**14**	**4.6**
The day the seeds are sown 30.01.2019								
Date of follow-up	**02.02.2019y**	50	28	19	47	41	20	26
	06.02.2019y	180	150	156	167	160	160	111
	13.02.2019y	290	270	253	290	273	247	225
	17.02.2019y	295	289	276	296	292	256	270
	Once	**5**	**11**	**24**	**4**	**8**	**34**	**10**
	They did not sprout,%	**1.6**	**3.6**	**8.0**	**1.3**	**2.6**	**11.3**	**3.3**
The day the seeds are sown 28.01.2020								
Date of follow-up	**01.02.2020y**	41	20	15	35	38	12	50
	05.02.2020y	172	140	140	166	170	80	164
	11.02.2020y	280	278	250	285	270	190	276
	14.02.2020y	292	280	268	290	291	260	289
	Once	**8**	**20**	**32**	**10**	**9**	**40**	**11**
	They did not sprout,%	**2.6**	**6.6**	**10.6**	**3.3**	**3.0**	**13.3**	**3.6**
HCP_{05}		1	**1**	**1.5**	**2**	**1**	**2.5**	**1**

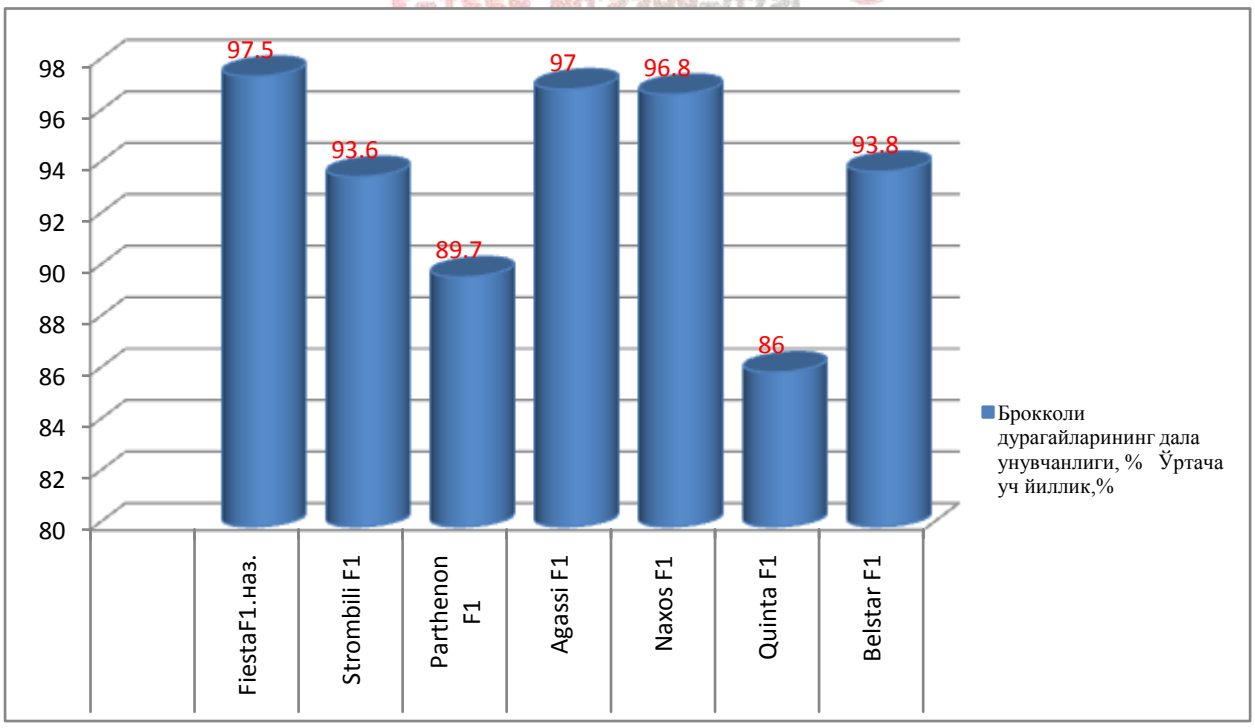
The results of a three-year field study of broccoli cultivars and hybrids show that Belstar F1 93.8%, Quinta F1 86% and Parthenon F1 89.7% were slightly lower than the hybrids studied.Among the hybrids studied, Fiesta F1 dominated with 97.5% Agassi F1 and Naxos F1 96.8% in terms of field fertility (Table 3, Figure 2).

Table 3.

Table 3. Seed germination dynamics three-year average (2018-2020, 300 seeds sown)

№	The name of the hybrids	2018			2019			2020			Average three years			
		Number of sprouts	the number of undeveloped seedlings	% account	Number of sprouts	the number of undeveloped seedlings	% account	Number of sprouts	the number of undeveloped seedlings	% account	Number of sprouts	the number of undeveloped seedlings	% account	Average of three years,%
1	$FiestaF_{1.control}$	291	9	3.0	295	5	1.6	292	8	2.6	292.6	7.3	2.40	97.5
2	Strombili F1	274	26	8.6	289	11	3.6	280	20	6.6	281	19	6.26	93.6
3	Parthenon F1	264	36	10.8	276	24	8.0	268	32	10.6	269.3	30.6	9.80	89.7
4	Agassi F1	287	13	4.3	296	4	1.3	290	10	3.3	291	9	2.96	97
5	Naxos F1	289	11	3.3	292	8	2.6	291	9	3.0	290.6	9.3	2.97	96.8
6	Quinta F1	258	42	14	256	34	11.3	260	40	13.3	258	38.6	12.86	86
7	Belstar F1	286	14	4.6	270	10	3.3	289	11	3.6	281.6	11.6	3.83	93.8
	HCP 05													

Figure 2. Field yield of broccoli hybrids, 2018-2020, in%



Another factor was observed in the field fertility observations of broccoli varieties and hybrids. The number of germinated seeds was also calculated on the basis of a three-year average. In first-year observations, unfertilized seeds ranged from 3–14%, with the lowest rates observed mainly in the Parthenon F1 and Quinta F1 hybrids.

In the following year, in 2019, unripe broccoli seeds performed much better than in the previous year. In particular, this year Parthenon accounted for 8% in F1 and Quinta in F1 for 11.3%. Among the studied hybrids, a good result was observed in 2019 in Strombili F1-3.6%, Agassi F1-1.3, Naxos F1-2.6%, Belstar F1-3.3%.

Studies show that for 3 years, broccoli seed yield was much lower than that of other hybrids, with Stromboli F1-6.26% Parthenon F1-9.8% and Quinta F1-12.86% in terms of low germination and seed rot. (Figure 3)

Fig.3

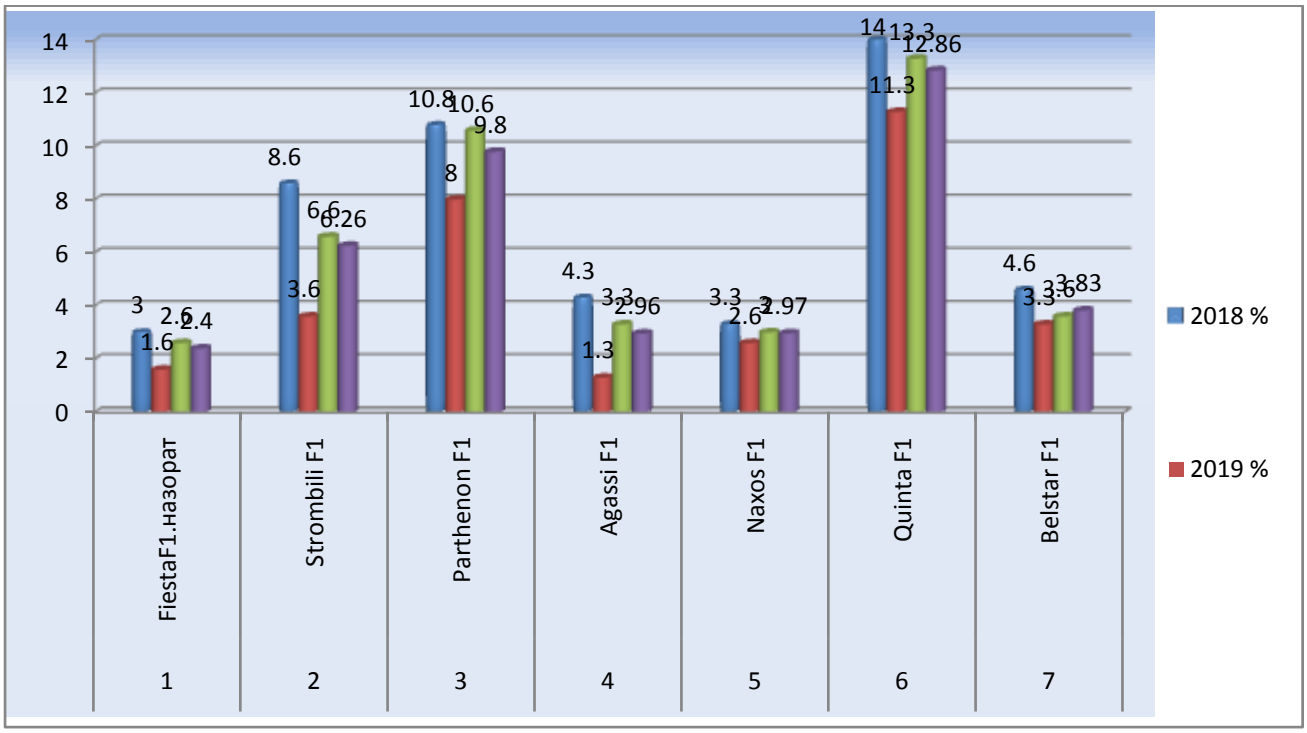


Figure 3 Analysis of broccoli varieties and hybrids of seeds that have not fully germinated over the years.(2018-2020,%)

The results of our study on the yield of central heads of broccoli cabbage show that the hybrids tested over three years were different.

During the three-year average yield analysis, the Agassi F1, Parthenon F1, and Naxos F1 hybrids performed better than the control.

Relatively low yields were observed in the Strombili F1 and Belstar F1 hybrids during the study years.

For an average of three years of our research, we showed that the hybrids Belstar F1 and Quinta F1 lasted 107-114 days, from the germination of broccoli seeds to the first harvest. Accordingly, the yield period was somewhat shorter (118).

The yield period of the other hybrids studied was somewhat longer, ie up to 126 days. (Table 4, Figure 4)

Table 4.
The yield of broccoli cabbage central and lateral heads, t / ha

№	The name of the hybrids	The period from germination to the first harvest		Leaves		Productivity t / ha		Overallproductivity	
		Harvestthefirstcrop	Harvestthefinalcrop	pieces/plant rast	t / haplant	Central	side	t / ha	% Ofcontrol
1	Fiesta$F_{1\ control}$	101	114	28,1	933	22,0	108	32,8	100
2	Strombili F_1	110	124	26,8	893	17,5	9,3	26,8	81,7
3	Parthenon F_1	115	126	29,3	1006	25,8	12,6	38,4	117,0
4	Agassi F_1	106	118	30,1	1017	26,8	12,40	39,2	119,5
5	Naxos F_1	110	125	29,6	1008	24,4	10,3	34,7	105,7
6	Quinta F_1	114	126	32,4	1030	19,8	11,5	31,3	95,4
7	Belstar F_1	107	118	34,5	1056	18,1	10,6	28,7	87,5
	HCP $_{05}$							2,7	3,4
	Sx,%							1,0	0,7

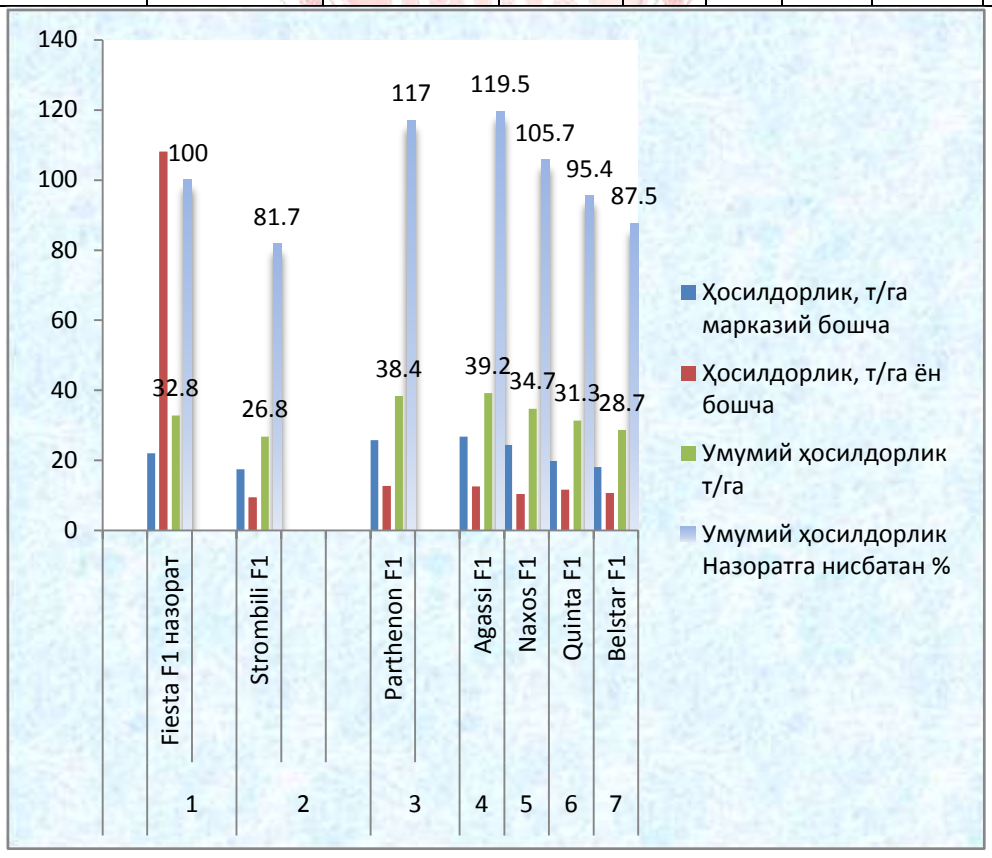


Figure 4. Compared to the control of yield of broccoli hybrids, t / ha

Storage research:

Given the increase in population in recent years, the demand for food is growing accordingly. It is obvious that it will be necessary to increase the number of storage varieties of fruits and vegetables and to increase the number of storage facilities.

According to research, after harvesting radishes, dill, spinach from vegetables in the open, a natural decrease of up to 10%, cucumbers and cabbage up to 5% is observed within a day or two.

As for broccoli cabbage, the harvest is slightly different from other types of cabbage. Harvesting of broccoli is carried out gradually and step by step. It is harvested every two to three days depending on technical maturity. If you do not harvest in time, the buds will lose their marketability if they bloom. The crop is harvested mainly in the cool of the morning or at the end of the day when the heat subsides a bit.

During the research, we conducted research on keeping the crop as long as possible, especially in the summer, by controlling the temperature and relative humidity in various ways, including natural and artificial, to deliver the product to the market, ie the population.

Broccoli cabbages planted in early spring grow very well in our climatic conditions. But after the days start to heat up, that is, after the temperature exceeds 300C, the development of broccoli and the formation of cabbage heads slows down a bit. Often passes into the flowering period without forming cabbage heads. This affects self-productivity.

Studies show that for broccoli cabbage to grow well, the temperature should be around 18-270C.

According to most literature, broccoli can be stored at home for 5-10 days in everyday life in general. But keeping it longer, up to 2-6 months, has not been studied in our conditions in terms of climate.

With the above in mind, we conducted research on the storage of broccoli cabbage in different ways, temperatures and relative humidity, as well as in different packaging and wrapping:

- In the usual way (at home, without taking into account the relative humidity)
- Wrapped in cling film in the usual way (at home, without taking into account the relative humidity)
- In refrigerated warehouses (at 1, 2, 30C, without taking into account the relative humidity)
- In refrigerated warehouses (at 1, 2, 30C, taking into account the relative humidity)
- In icy conditions

In our study, we covered 7 of these hybrids over a three-year period from cultivation to the storage, covering exactly these problems, and the following results were obtained.

Our studies show that of the 7 broccoli hybrids studied, the natural decrease was 53–68% in Agassi F1, Naxos F1, and Parthenon F1 when stored at 10C (80 days) in refrigerated warehouses without regard to relative humidity. In the remaining broccoli hybrids studied, a natural decrease of 71–77% was observed close to each other(Table5, Figure5).

Table 5.

Table 5. Natural decrease (when relative humidity is not taken into account) during storage of broccoli cabbage in the open state at 10 C in a refrigerated warehouse, gr, 2018-2020 y.

№	Hybrids	1-10days	2 – 10days	3 – 10days	4 – 10days	5 – 10days	6 – 10days	7 – 10days	8 – 10days	Average, gr	Loss, gr	%, in the account
2018 – 2020												

1	FiestaF$_1$ control	4890	4620	4080	3455	2530	2270	2630	1120	3199,3	3770	77,09
2	Strombili F$_1$	5262	4682	4070	3710	2625	2060	1750	1510	3208,6	3752	71,30
3	Parthenon F$_1$	5460	4650	4124	3574	3040	2655	2070	1735	3413,5	3725	68,22
4	Agassi F$_1$	5245	4786	4357	3658	3072	2654	1890	1650	3414	3595	68,54
5	Naxos F$_1$	3480	3254	3185	2938	2709	2631	2140	1630	2745,8	1850	53,16
6	Quinta F$_1$	5402	4310	3830	2940	2475	2155	1645	1080	2979,6	4322	80,00
7	Belstar F$_1$	5260	4680	4079	3710	2620	2065	1750	1515	3209,8	3745	71,19
	HCP $_{05}$									4,3	2,4	4,7
	Sx,%									1,0	0,1	0,2

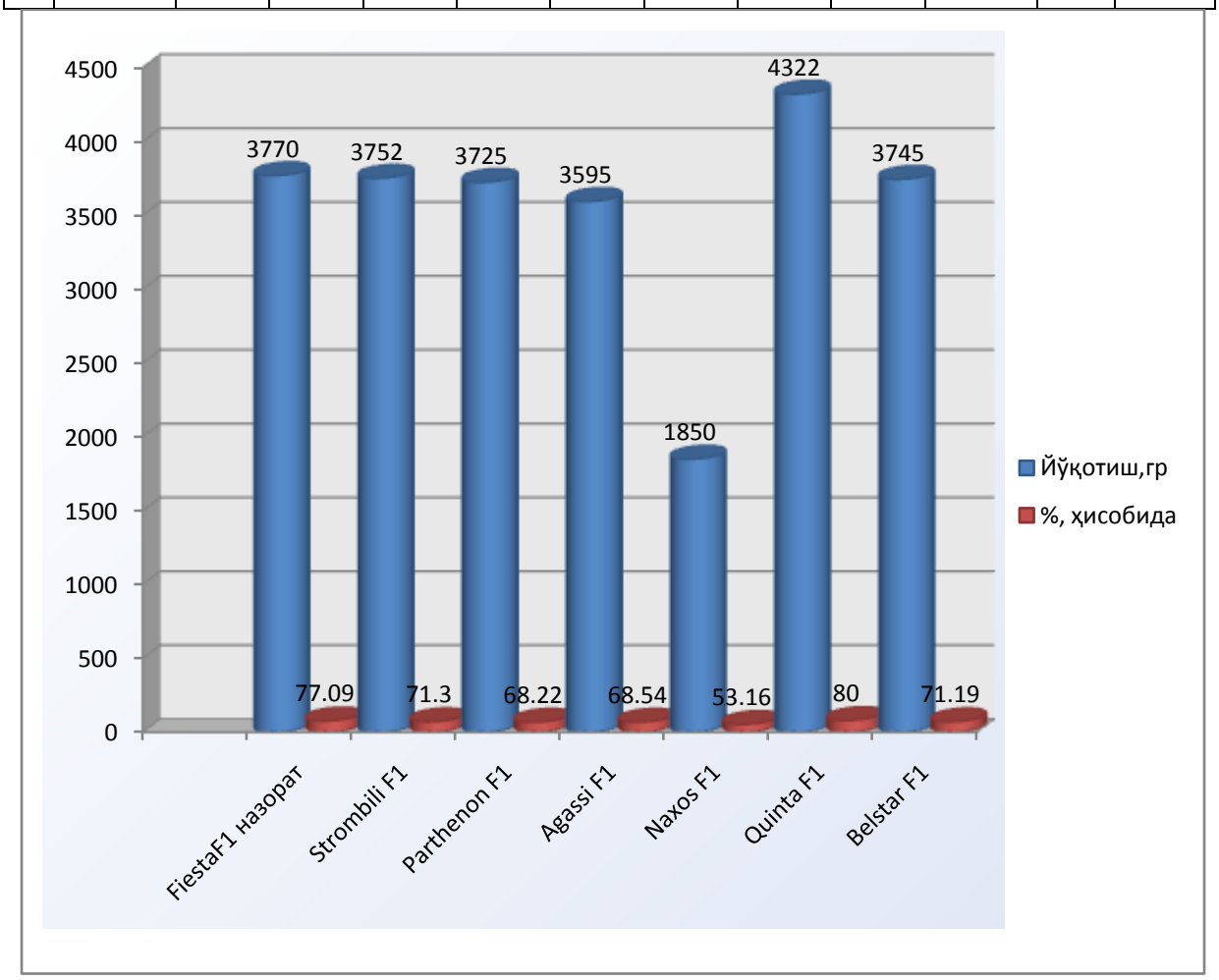


Figure 5 Natural decrease (when relative humidity is not taken into account) during storage of broccoli cabbage in the open state at 10S in a refrigerated warehouse, gr, 2018-2020 y.

Experiments were carried out on the storage of relative humidity 90, 92, 95, 98% at temperatures 10S, the 20S, 30S in warehouses cooled from broccoli cabbage hybrids.

The best result from our storage experiments over three years was a natural decrease in 10S temperature 95% relative humidity (for 80 days) in our Fiesta F1 control hybrid 12.9%, Agassi F1 9.0%, Naxos F1 10.6%, Parthenon was up 10.1% in F1. In the remaining broccoli hybrids studied, a natural decrease of 14.1 to 16.7% was observed close to each other (Table 6, Figure 6).

Table 6. Natural decrease (relative humidity 92%) during storage of broccoli cabbage in the open state at 10Cin a refrigerated warehouse, gr, 2018-2020 y.

№	Hybrids	1-10days	2 – 10days	3 – 10days	4 – 10days	5 – 10days	6 – 10days	7 – 10days	8 – 10days	Average, gr	Loss, gr	%, in the account
2018 – 2020												
1	Fiesta F_1 control	5890	5800	5750	5600	5500	5460	5202	5130	5541,5	760	12,9
2	Strombili F_1	4350	4150	4050	3890	3750	3700	3680	3620	3898,7	730	16,7
3	Parthenon F_1	4450	4300	4225	4204	4180	4080	4050	4000	4186,1	450	10,1
4	Agassi F_1	5200	5100	5050	4940	4830	4800	4790	4730	4930	470	9,0
5	Naxos F_1	3580	3554	3535	3518	3409	3380	3320	3200	3437	380	10,6
6	Quinta F_1	4602	4580	4550	4520	4495	4410	4345	3950	4431,5	652	14,1
7	Belstar F_1	4860	4760	4709	4690	4575	4450	4320	4100	4558	760	15,6
	HCP $_{05}$									3,8	2,5	3,7
	Sx,%									1,0	0,2	0,4

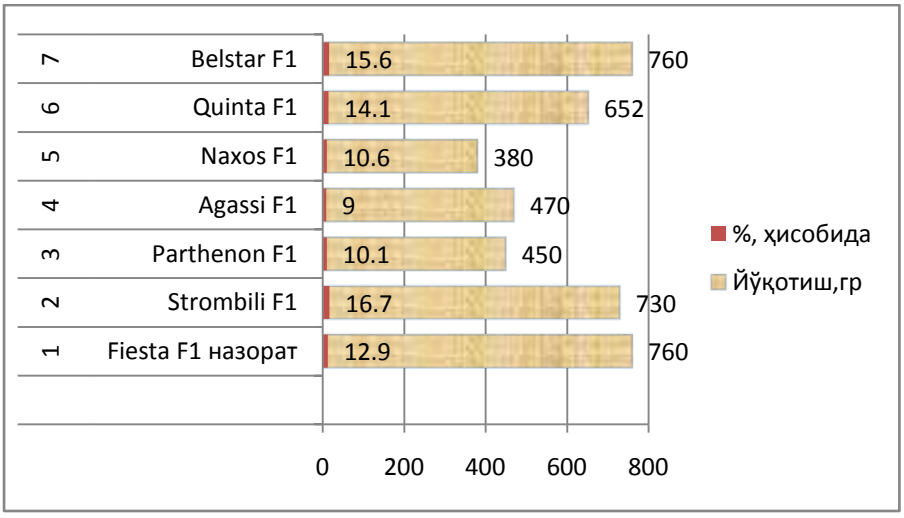


Figure 6 Natural decrease (relative humidity 92%) during storage of broccoli cabbage in the open state at 10S in a refrigerated warehouse, gr, 2018-2020 y.

In the refrigerated warehouses of broccoli cabbage hybrids, experiments were carried out to keep the relative humidity at 90, 92, 95, 98% at 10S, the 20S, 30S in food film (string) and the following results were obtained.

Our studies over three years were almost indistinguishable. Broccoli hybrids brought for storage were initially divided into commodities and non-commodities, each wrapped in a separate stretch film. 10 of the wrapped broccoli hybrids were isolated and placed in refrigerators according to the options and observed for 80 days.

The best result from our storage experiments during the observations was a natural decrease in 10S temperature 95% relative humidity (for 80 days) in our Fiesta F1 control hybrid 6.5%, Agassi F1 4.8%, Naxos F1 5.5%, Parthenon Was up 5.3% at F1. In the remaining broccoli hybrids studied, a natural decrease was observed close to each other, ie from 6.5 to 7.4% (Table 7, Figure 7).

Physico-chemical analysis of fresh broccoli cabbage before storage showed that the amount of soluble solids in 2018 - 2020 is 10.5%, vitamin C - 130.0 mg / 100 g, ash - 0.6%. After storing the products in the control option for a month, the appearance was less reddish, the turgor was lost as a result of the evaporation of the reddish colour on the moisture surface, and the market capability was lost.

The best results were obtained in our variant with a layer of 50 μm using strips of film. The content of vitamin C in broccoli after storage was 111.5–113.5 mg / 100 g, and the content of soluble substances was 7.2–7.5%.

Table 7. Natural decrease (relative humidity 92%) during storage at 10C in the case of stretch wrapped broccoli cabbage in a refrigerated warehouse, gr, 2018-2020 y.

№	Hybrids	1-10days	2 – 10days	3 – 10days	4 – 10days	5 – 10days	6 – 10days	7 – 10days	8 – 10days	Average, gr	Loss, gr	%, in the account
2018 – 2020												
1	Fiesta F_1 control	4550	4550	4545	4530	4500	4420	4380	4250	4465,6	300	6,5
2	Strombili F_1	4455	4455	4450	4340	4320	4305	4295	4125	4343,1	330	7,4
3	Parthenon F_1	5260	5260	5250	5235	5225	5218	5205	4980	5204,1	280	5,3
4	Agassi F_1	5140	5140	5136	5130	5115	5090	5020	4890	5082,6	250	4,8
5	Naxos F_1	4905	4905	4900	4890	4880	4870	4860	4635	4855,6	270	5,5
6	Quinta F_1	4700	4700	4690	4675	4660	4650	4625	4390	4636,2	310	6,5
7	Belstar F_1	4660	4620	4610	4590	4510	4490	4430	4340	4531,2	320	6,8
	HCP_{05}											
	Sx,%											

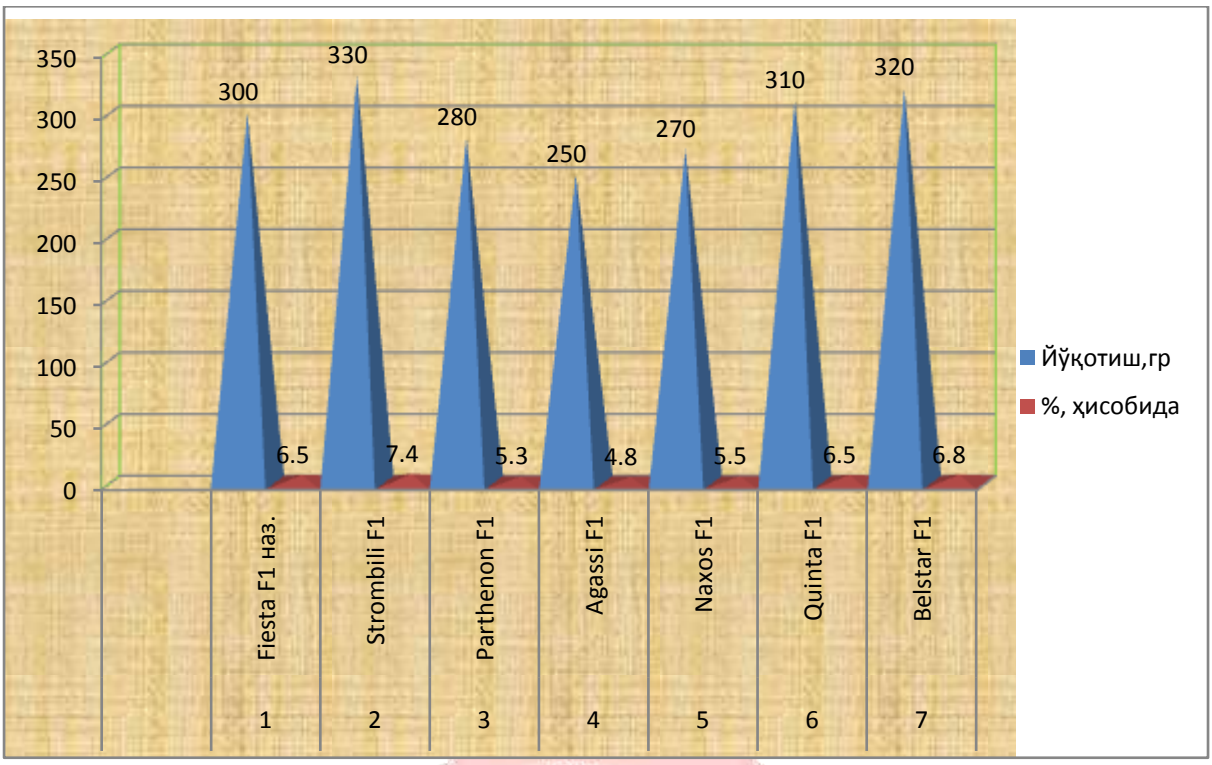


Figure 7 Natural decrease (relative humidity 92%) during storage at 10C in the case of stretch wrapped broccoli cabbage in a refrigerated warehouse, gr, 2018-2020 y.

Nowadays, another method of storing broccoli cabbage in frozen conditions is widely used around the world. This method has been very effective in recent years, especially in export-oriented farms. In our research, we conducted experiments in this regard as well without bypassing this method.

To preserve broccoli in this way, we first need to start by picking it from the field. Harvesting broccoli cabbage cannot be done at the same time because not all cabbage heads are ripe at the same time. When harvesting from the field, the central heads are cut to a diameter of 12-20 cm, the length of the stem to 17-18 cm, and the height of 23 cm is placed in 40x60 boxes without trying. In the same way the crop is harvested 3–4 times. This usually takes 18-25 days.

Harvested broccoli cabbages are stored at 20-250S and gradually lowered to 20S. Then the foam (foam) measuring 40x60 by 18 cm is placed in boxes with the core cut into 15 cm. Before placing in the box, a film of 100x100 cm in size measuring 0.5 μm is placed inside. One box can hold 15-24 pieces of broccoli cabbage with central heads. It is stuffed with 350-800 grams of cabbage, which is mainly export-oriented. After placing in the boxes, about 2 kg of ice is removed from each box prepared using an ice machine. In the next stage, it is immediately placed in a warehouse where it is cooled to 00S. In this case, broccoli cabbage was stored for 3–6 months (Fig. 8).

Fig 8.

Figure 8 Storing broccoli in frozen conditions

CONCLUSION

1. The results of our experiments allow us to conclude that among the studied broccoli hybrids, Agassi F1 and Naxos F1 were somewhat more productive. Their growth, development, and productivity were 1.1 and 1.2 times higher than controls, respectively.

2. The products have high nutritional value and the best results are obtained by storing the raw material at a temperature of 1 ° C at 92% relative humidity 10.6% in Agassi F1, 9.0% in Naxos F1, 10.1% in Parthenon F1 broccoli hybrids was

3. When broccoli cabbage heads were stored for 80 days at 1 ° C without taking into account the relative humidity, the product did not achieve quality storage. Losses of up to 50-77% were observed during storage.

4. Wrapping of broccoli cabbage heads in polyethene film while maintaining its quality for 80 days showed a loss of 4.8-7.4%.

5. The best results were obtained when storing broccoli cabbage heads with ice. Almost no losses were observed when stored with this method.

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